

(19) World Intellectual Property  
Organization  
International Bureau



(43) International Publication Date  
6 May 2005 (06.05.2005)

PCT

(10) International Publication Number  
**WO 2005/041371 A1**

(51) International Patent Classification<sup>7</sup>: **H01S 5/14**

(21) International Application Number:  
PCT/EP2003/010856

(22) International Filing Date:  
30 September 2003 (30.09.2003)

(25) Filing Language: English

(26) Publication Language: English

(71) Applicants (for all designated States except US):  
**PIRELLI & C. S.p.A.** [IT/IT]; Via Gaetano Negri, 10,  
I-20123 Milano (IT). **TELECOM ITALIA S.p.A.** [IT/IT];  
Piazza degli Affari, 2, I-20123 Milano (IT).

(72) Inventors; and

(75) Inventors/Applicants (for US only): **ROMANO, Andrea**  
[IT/IT]; Pirelli Labs S.p.A., Viale Sarca 222, I-20126 Mi-  
lano (IT). **DE DONNO, Marco** [IT/IT]; Pirelli Labs S.p.A.,

Viale Sarca, 222, I-20126 Milano (IT). **PIANCIOLA, Au-  
rello** [IT/IT]; Pirelli Labs S.p.A., Viale Sarca 222, I-20126  
Milano (IT).

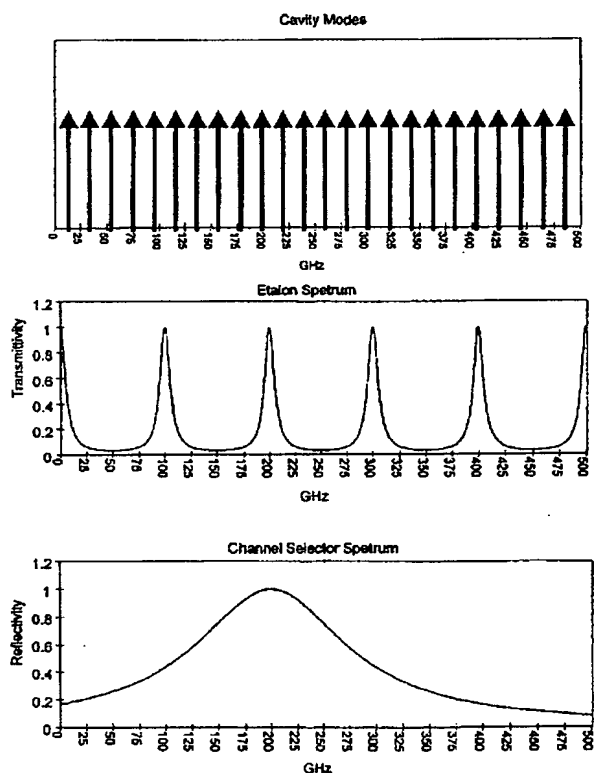
(74) Agents: **GIANNESI, Pier, Giovanni et al.**; Pirelli & C.  
S.p.A., Viale Sarca, 222, I-20126 Milano (IT).

(81) Designated States (national): AE, AG, AL, AM, AT, AU,  
AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU,  
CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH,  
GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC,  
LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW,  
MX, MZ, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC,  
SD, SE, SG, SK, SL, SY, TJ, TM, TN, TR, TT, TZ, UA,  
UG, US, UZ, VC, VN, YU, ZA, ZM, ZW.

(84) Designated States (regional): ARIPO patent (GH, GM,  
KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW),  
Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM),  
European patent (AT, BE, BG, CH, CY, CZ, DE, DK, EE,  
ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PT, RO,

[Continued on next page]

(54) Title: PHASE-CONTROL IN AN EXTERNAL-CAVITY TUNEABLE LASER



(57) Abstract: The present invention relates to a single-mode external-cavity tuneable laser including a gain medium, a tuneable element and a channel allocation grid element. The channel allocation grid element is preferably a FP etalon, which is structured and configured to define a plurality of equally spaced transmission peaks corresponding to the ITU channel grid, e.g., 200, 100, 50 or 25 GHz. The tuneable element, preferably a tuneable mirror, serves as the coarse tuning element that discriminates between the peaks of the grid etalon. The tuneable laser of the invention has a relatively short cavity length of not more than 15 mm, preferably not larger than 12 mm. It has been found that the FP etalon introduces a phase non-linearity in the external cavity, which induces a compression of the cavity modes, i.e., a reduction in the cavity mode spacing, in correspondence to the etalon transmission peaks. Mode compression increases with the decrease of the FWHM bandwidth of the grid FP etalon, hereafter referred to as  $(FWHM)_{FP}$ .  $(FWHM)_{FP}$  should be comprised in the range from about 2 GHz to about 8 GHz. Preferably,  $(FWHM)_{FP}$  is comprised between approximately 3 and 6 GHz.



SE, SI, SK, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

*For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.*

**Published:**

— with international search report